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NOTES ON THE SPECIES OF TREE DATURAS

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THE great variability of the arborescent *Daturas*, *Datura* sect. *Brugmansia* Pers., has led to the proposal of about two dozen specific names. In 1895, Lagerheim (9) ably monographed seven Ecuadorean *Brugmansias*, four of which he proposed as new. Safford's synopsis of the genus in 1921 (11) treated 14 arborescent species, including three new concepts and two new names for older ones. Danert's recent discussion (5) of sectional characters in *Datura* and the possible conspecificity of several arborescent species includes a key to six cultivated tree *Daturas*. DeWolf (6) has followed Safford in reviewing five species among the North American cultivated tree *Daturas*. The newest concept, established in 1959, is *D. vulcanicola* A. S. Barclay (2).

It is the aim of the present notes to suggest that excessive attention has been devoted to characters of infraspecific variability in the recognition of the 15 species currently accepted in *Datura* sect. *Brugmansia*. A key to the principal species is given, together with the more important synonyms of each. For a complete list of specific

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names published before 1921, but not treated by Safford at that time, see Sachet (10) and Fosberg (7). Collections of several species are very limited or absent in a number of our larger herbaria (A, COL, GH, NY, US).

Of the numerous collections of conspicuous and highly attractive tree *Daturas* in these herbaria, nearly all are referable to three taxa: *D. candida* (Pers.) Saff., *D. suaveolens* H. & B. ex Willd. and *D. sanguinea* R. & P. DeWolf (6) and the herbarium determinations of A. S. Barclay in 1959 are in agreement here. Each of the remaining collections most frequently displays a unique combination of characters, and several such collections have been selected for the typification of new species. In 1955, Schultes (12) described as *Methysticodendron Amesianum* what I believe to be a greatly modified tree *Datura* from the Valley of Sibundoy in southern Colombia.

It is interesting to note that, in 1891, Wettstein's summary (15) of the Solanaceae for Engler and Prantl's *Die Natürlichen Pflanzenfamilien* cited only three arborescent *Daturas*, although several more had been described by that time. He cited *D. sanguinea*, *D. suaveolens* and *D. arborea*, the last very probably referring to plants identified here as *D. candida*, and thus he anticipated by more than half a century the growing realization (3, 5, 6) that the principal species of tree *Daturas* are few in number.

The very extensive work of Blakeslee and his associates (1) with the herbaceous *Daturas* demonstrated a great range of variability and the spontaneous appearance of many unusual characteristics. Of the 541 gene mutations encountered, 72 appeared following heating, wounding and ageing, or spontaneously in nature. Recessive genes controlling leaf shape, flower size, shape and color, and fruit form are among those uncovered. It is entirely

possible that many of these single recessive genes affecting taxonomically significant characters are present also in the tree *Daturas*. In Colombia, I have observed unusual tree *Daturas* which resemble the striking effects produced in herbaceous species by the single recessive genes "equisetum", "tricarpet" and "quercina" (*Bristol* 1112, 1162, 566; GH).

Many writers have noticed the frequency with which the tree *Daturas* are associated with human habitations, but the extent of this association and its implications have not been fully understood. I have seen no indication in herbaria nor during 13 months of field work in southern Colombia and northern Ecuador that any tree *Datura* was not associated with human activity; and Schultes (pers. comm.), in his many years of familiarity with northwestern South America, has never seen a tree *Datura* that he could say was truly wild. The northern Andes, however, is the centre of variability and probable area of origin of this group. In the same region, there is a conspicuous absence of seedling tree *Daturas*, although Schultes once observed abundant seedlings of *D. vulcanicola*. The reason for the usual failure of seeds to regenerate colonies is obscure, but it may relate to the normal indehiscence of fruits; if given normal care in a greenhouse, seeds of *D. candida* and *D. sanguinea* produce healthy seedlings. Throughout the northern Andes, it is customary for man to propagate tree *Daturas* by large cuttings. As no other mode of reproduction appears to be operative, and since they are nowhere encountered as an element of natural vegetation, it appears that the tree *Daturas* have achieved their present, highly ornamental form under domestication and thus should be considered as cultigens.

If we reflect upon this occurrence of highly attractive, medicinally and narcotically useful plants possessing

great variability in a practically exclusive association with man, it seems entirely likely that much of the observable variation in the group has resulted from man's preferential maintenance of conspicuously different forms. The size of the flowers, among the largest of all flowering plants, facilitates, both for the native and for the botanist, the detection of differences that often go unnoticed in flowers of smaller size. Because of the paucity of seedlings, implying ineffective sexual reproduction, we cannot yet confidently infer whether the numerous cultivars have arisen primarily through hybridization and gene recombination or through the appearance of mutations as bud sports or chimeras. In any case, most of our attempts to delimit species amidst these circumstances have been unwarranted.

The characters used by Safford (11) to distinguish species are not always unique to the entities that he attempts to separate. For example, in studying a large population of *D. candida* in the Valley of Sibundoy in Andean southern Colombia, I noted the presence of both spathe-like and several-pointed calyces (as in *D. sauveolens*), of rounded, as well as emarginate, corolla margins (as in *D. arborea* and *D. cornigera*) and of corollas varying from under 20 to over 32 cms. in length. Seeds of four of the five species illustrated by Lagerheim (9), though apparently distinctive, can be seen in a single fruit of *D. candida*.

It is hoped that controlled hybridization experiments and more intensive observation of natural populations will eventually contribute to a better understanding of the great variability in the tree *Daturas*.

Key to principal species of *Datura*
sect. *Brugmansia* Pers. (cf. Plate XXVII).

- A. Leaves angular to repand, apex acute to obtuse; flowers mostly red (rarely yellow), 17–25 cm., their corolla teeth not exceeding 2 cm.; anthers 1.2–1.8 cm.; fruit ovoid to oblong-elliptic; seeds rounded, verruculose. *D. sanguinea*
- AA. Leaves entire (rarely coarsely dentate), apex acute to acuminate; flowers white (rarely yellow or slightly reddish), 17–45 cm., their corolla teeth much exceeding 2 cm.; anthers 2.5–4 cm.; fruit elongate; seeds angular or irregularly ridged.
 - B. Calyx 1.5–3 cm. broad, usually 1–3-toothed; flowers rarely exceeding 30 cm., the slender basal part of the corolla tube not visible or reaching only the calyx tip; corolla teeth 4–9 cm.; anthers distinct; fruit oblong-cylindric to fusiform; seeds with a greatly thickened suberose testa. . . *D. candida*
 - BB. Calyx 2–4 cm. broad, usually 3–5-toothed; flowers often exceeding 30 cm., the slender basal part of the corolla tube conspicuously exceeding the calyx, corolla teeth 2–5 cm.; anthers connivent; fruit fusiform (rare); seeds lacking a thick suberose testa. *D. suaveolens*

1. *Datura sanguinea* Ruiz & Pavón Fl. Peruv. 2: 15. 1799.

Brugmansia bicolor Persoon Syn. Pl. 1: 216. 1805; Lindley Bot. Reg. 20: pl. 1739. 1834.

B. sanguinea D. Don in Sweet Brit. Fl. Gard. 11. 3: pl. 272. 1835; Lagerheim Bot. Jahrb. Engl. 20: 662. 1895.

Small trees, 2–5 meters in height; leaves soft-pubescent, the lower repand to angular, the upper usually entire; flowers 17–25 cm. long, the corolla with a short-toothed, recurved to strongly reflexed (rarely erect) limb, the tube typically green within the calyx, yellow at the middle, and red or orange-red (rarely yellow-orange or bronze) toward the limb, the ribs yellow; anthers 1.2–1.8 cm., beneath an obtuse stigma; fruit ovoid (rarely

oblong-elliptic), calyx persistent or caducous, the base rounded to acute (rarely acuminate) and mucronate, in cross-section usually bilaterally flattened, or 4-5-sided to nearly round with 2 or 4 longitudinal sulci; seeds verruculose and lacking a greatly thickened testa. $n=12$ (*Bristol 1114*; GH).

These are a common sight about towns and habitations in many areas of highland Colombia and Ecuador, but they are not seen at middle and lower elevations.

SPECIMENS EXAMINED:

UNITED STATES: *Walther 542*. COLOMBIA: *Bristol 419, 653, 715, 1114, 1345, 1354, 1419, 1420, 1446*; *Chindoy 198*; *Cuatrecasas 13644*; *Fosberg 20562*; *Foster & Foster 1945*; *García-B. 7847*; *Holton 548*; *Idrobo 2223, 2239*; *Overton 0-56-106*; *Schultes 6591A, 7078, 7103*; *Schultes & Villarreal 7522g, 7538, 7556, 7689, 7893A, 8031, 8040, 8041*; *Soejarto 204*. ECUADOR: *Bristol 1374, 1375, 1377, 1378, 1379, 1380, 1383*; *Hitchcock 20939*; *Rimbach 1, 7, 63*; *Rose & Rose 22344*. PERU: *Hartweg 815*; *Kanehira 224*; *Metcalf 30493*; *West 3692*. BOLIVIA: *Bang 1942*; *Brooke 6177*.

There are several color-forms (9), of which one has already received formal recognition.

- A. Exposed part of corolla entirely yellow 'Flava'
- AA. Exposed part of corolla entirely red, or green at the middle and red toward the limb 'Sangre'

1a. cv. Flava.

Datura sanguinea β *flava* Dunal in DC. Prod. 13: 545. 1852.

D. Rosei Safford Journ. Wash. Acad. Sci. 11: 188. 1921.

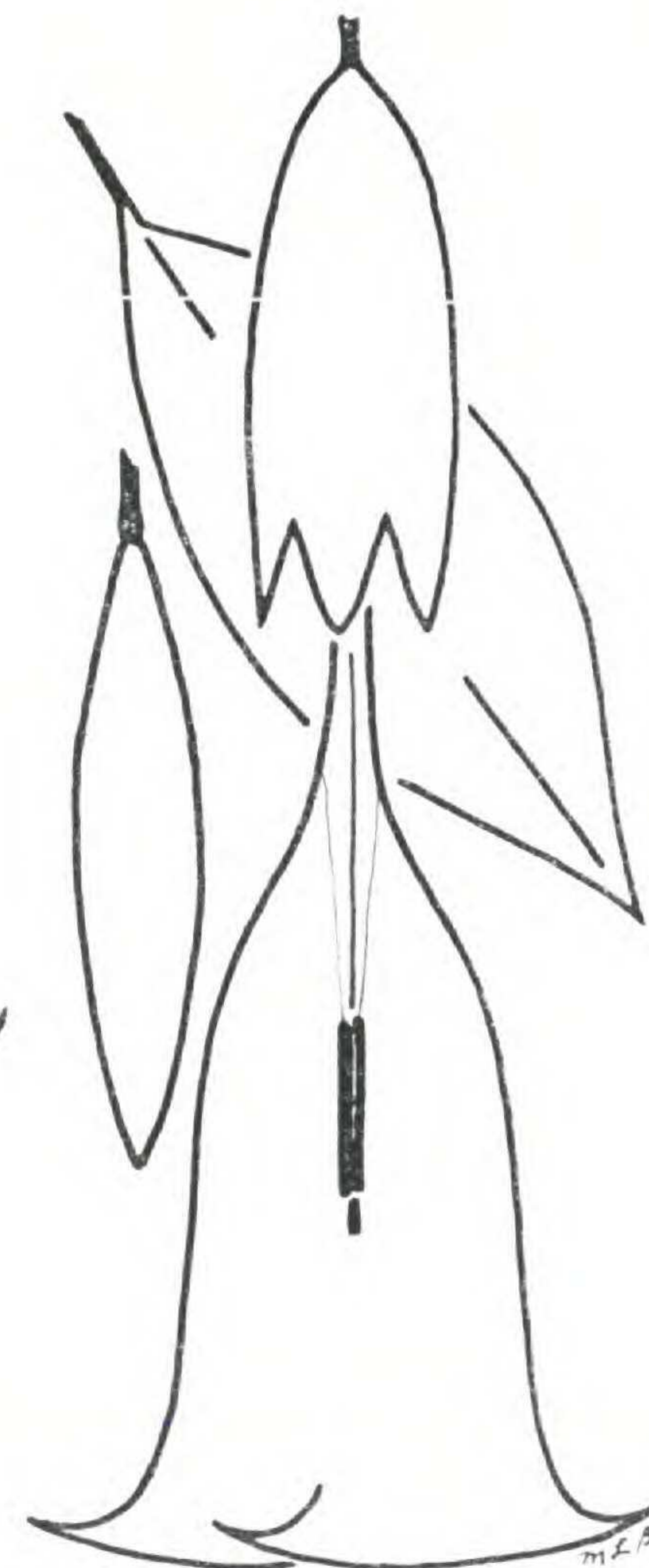
D. sanguinea 'Flava', with brilliant yellow flowers, is cultivated in the highlands of central Ecuador and southern Colombia. Safford's species differs from *D. sanguinea* only in its angular, densely tomentose upper leaves and in its orange or saffron-yellow corolla, the color placing



D. sanguinea



D. candida



D. suaveolens



Datura sanguinea: *Bristol 1373* (GH), Ecuador, Carchi, alt. 2900 m. *D. candida*: *Bristol 1255* (GH) flower and leaf, *Bristol 1098* (GH) fruit; Colombia, Putumayo, alt. 2200 m. *D. suaveolens*: *Heller 4486* (GH) flower and leaf, Puerto Rico, near sea level; fruit *fide* Safford (11), Brazil, Minas Gerais.

it with cv. *Flava*. The calyx of *D. Rosei* does not terminate in a single horn-like point as once emphasized (6).

SPECIMENS EXAMINED:

COLOMBIA: *Bristol* 1800. ECUADOR: *Rose, Pachano & Rose* 22965 (TYPE *D. Rosei*; US).

1b. cv. *Sangre*, n. cv.

D. sanguinea 'Sangre', with a deep red corolla entirely devoid of yellow, is cultivated at several places in the highlands of southern Colombia and northern Ecuador.

SPECIMENS EXAMINED:

COLOMBIA: *Bristol* 652, 1307, 1309. ECUADOR: *Bristol* 1372, 1373, 1381, 1382, 1795.

2. *Datura candida* (Pers.) Safford Journ. Wash. Acad. Sci. 11: 182. 1921.

Brugmansia candida Persoon Syn. Pl. 1: 216. 1805.

Datura arborea Ruiz & Pavón Fl. Peruv. 2: 15. pl. 128. 1799; non *D. arborea* L.

D. aurea Lagerheim Gartenfl. 42: 33. 1893; Safford *ibid.* 186. 1921.

B. aurea Lagerheim Bot. Jahrb. Engl. 20: 664. 1895.

B. arborea Lagerheim *ibid.* 663. 1895.

D. affinis Safford *ibid.* 186. 1921.

D. Pittieri Safford *ibid.* 187. 1921.

This variable species is the most common of the white flowered tree *Daturas* in Andean South America. A small tree, 3–5 meters in height; leaves glabrous or minutely pubescent, ovate or oblong-elliptic, entire or coarsely dentate; calyx 1.5–3 cm. broad, 1–4-toothed; the slender basal part of the white corolla wholly enclosed by the calyx, the limb flaring broadly with long (4–9 cm.) recurved teeth; anthers distinct; fruit oblong-cylindric to fusiform and lacking a persistent calyx; seeds

PLATE XXVIII



Datura candida (Pers.) Saff. (*D. aurea* Lagerh.). Near Zipaquirá, Colombia. Photograph by R. E. SCHULTES

angular, with a greatly thickened, suberose testa. $n=12$ (*Bristol 1193, 1255; GH*).

Both the calyx and corolla are variable in length, but the corolla rarely measures less than 20 cm. or more than 30 cm. long. Fruiting is very infrequent, and this supports the contentions of Joshi (8) and Barclay (3) that the tree *Daturas*, the populations of which often consist of a single clone, are self incompatible. Despite the illustration by Ruíz and Pavón (reproduced by DeWolf, 6) upon which Persoon based his description, a persistent calyx is rarely seen either in the field or in the herbarium.

D. candida has been spread through much of Latin America and elsewhere from the northern Andes, where it thrives in the warm days and cool nights between 1500 and 2500 meters elevation.

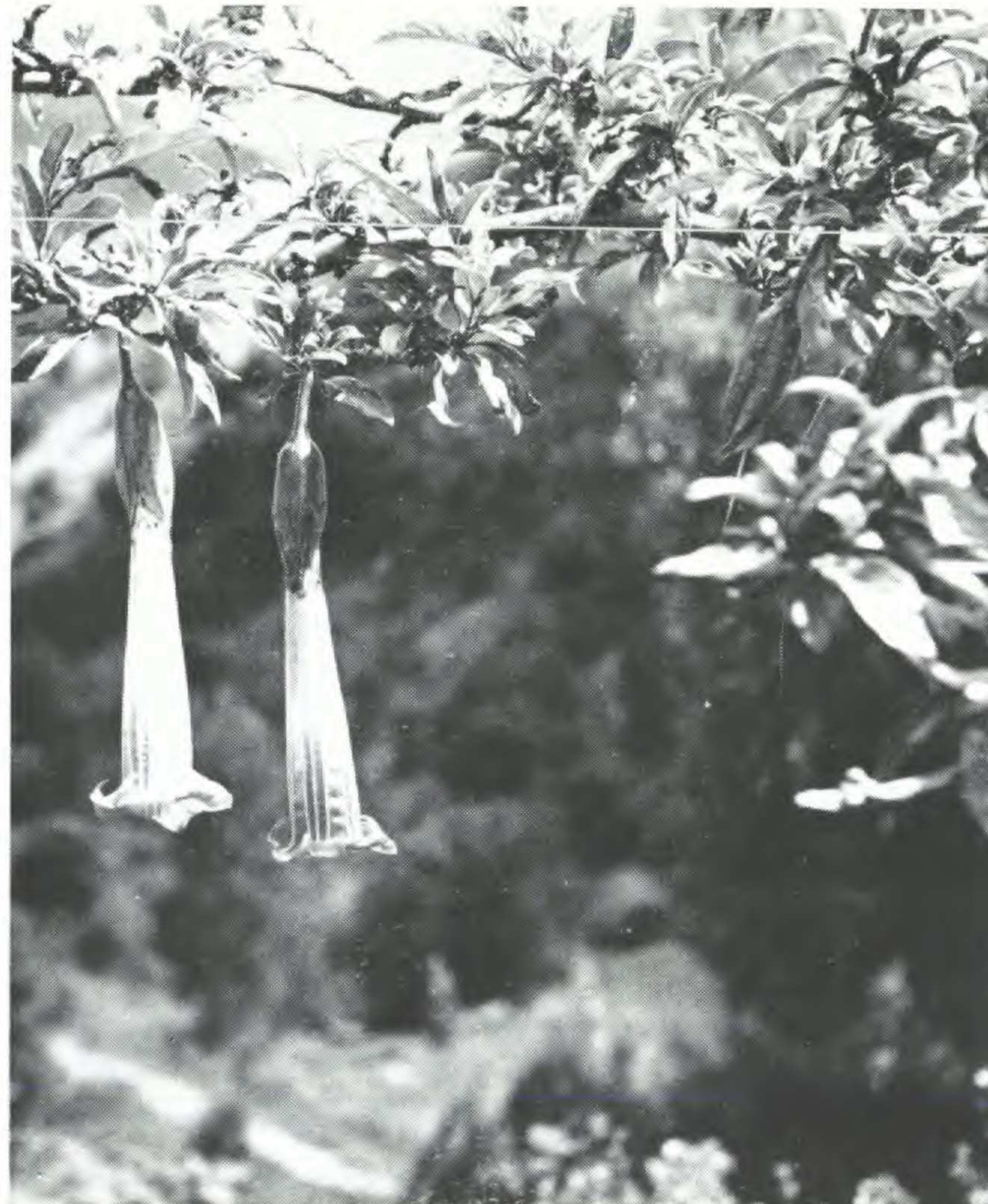
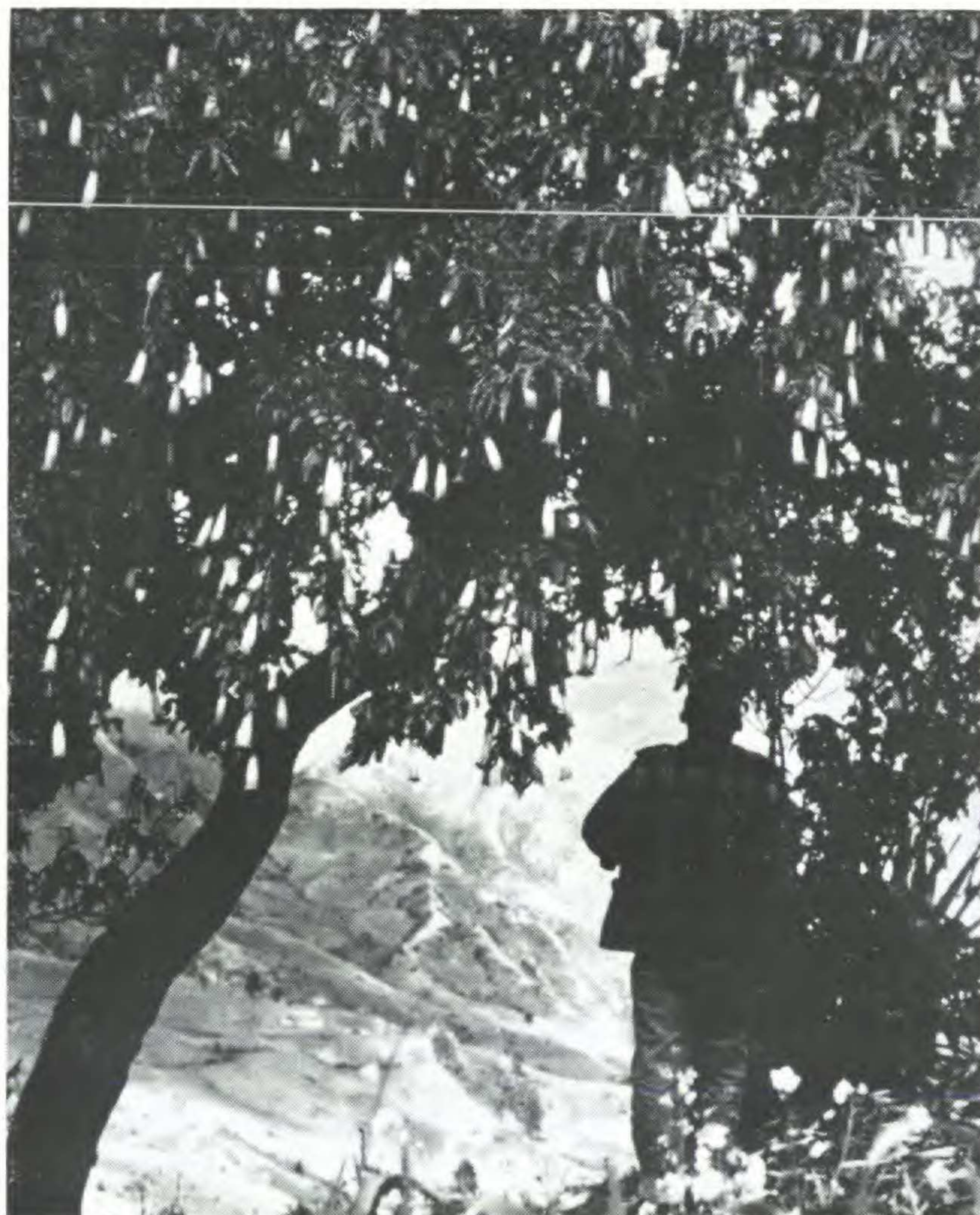
D. affinis Saff. is based on the description of *Brugmansia arborea* (L.) Lagerh. of which *D. arborea* L. is the basionym. Lagerheim noted its good agreement with Pavón's specimens labelled "*D. arborea* Fl. Per." (Ruíz and Pavón's *D. arborea* L.), e.g., *D. candida* (Pers.) Saff. In proposing *D. affinis*, Safford relied upon the glabrous peduncle and the 2-5-toothed calyx to separate the concept from *D. candida*. The white corolla is short, as in *D. aurea*, and Safford observed that *D. affinis* is "very closely allied" to this species.

D. aurea Lagerh. differs from *D. candida* only in its longer calyx and shorter corolla which remains yellow after emerging. As with *D. affinis*, the fruit and seeds are those of *D. candida*.

D. Pittieri Saff. is easily referable to *D. candida* in spite of the short corolla and anthers which chiefly distinguish it.

SPECIMENS EXAMINED:

MEXICO: *Botteri 1090; Greenman 131; Muller 265; Pringle 6321, 13126; Rose 3243; Seaton 94; Seler 56; Schultes & Reko 455.* GUATE-



(Left) *Datura sanguinea* R. & P. Above Zipaquirá, Colombia. Photograph by R. E. SCHULTES

(Right) *Datura sanguinea* R. & P. Below Páramo de Chisacá, Cundinamarca, Colombia. Photograph by D. SOEJARTO

MALA: *King* 3295; *Skutch* 1754; *J. D. Smith* 1878; *von Turckheim* 2246. EL SALVADOR: *Calderón* 1819; *Fassett* 28307; *Standley* 19332. COSTA RICA: *Heiser* 3583. CUBA: *van Hermann* 407, 2647. HISPANIOLA: *Augusto* 413. BAHAMAS: *Curtiss* 194. BERMUDA: *Collins* 441. COLOMBIA: *André* 2093; *Bristol* 345, 458, 564, 566, 567, 751, 775, 887, 889, 890, 999, 1080, 1098, 1109, 1110, 1111, 1117, 1121, 1122, 1162, 1189, 1192, 1193, 1194, 1213, 1246, 1255, 1264, 1266, 1267, 1268, 1297, 1299, 1304, 1305, 1311, 1333, 1346, 1347, 1348, 1356, 1388, 1431, 1432, 1433, 1434, 1435, 1438, 1439, 1447, 1448; *Chindoy* 190; *Cuatrecasas* 11463, 13636, 19429; *Cuatrecasas, Schultes & E. Smith* 12599; *Fosberg* 20568; *García-B.* 4640; *Holton* 546, 547; *Killip* 8265; *Killip & Hazen* 9563; *Killip & Smith* 15408, 16678, 18315; *Laxerance* 120; *Pennell & Killip* 8066; *Pittier* 1305 (TYPE: *D. Pittieri*; US); *Schultes* 3207, 7083; *Schultes & Villarreal* 5212, 7638, 7809, 7917; *H. H. Smith* 1157; *Soejarto* 278; *Toro* 24, 649, 750. PERU: *Macbride* 4061; *Wurdack* 1785. BOLIVIA: *Steinbach* 8433. ARGENTINA: *Venturi* 8495. VENEZUELA: *Aristeguieta* 2416. CONGO: *Tejeune* 315. HAWAII: *Degener* 7366, 7367.

3. *Datura suaveolens* Humboldt & Bonpland ex Willdenow Enum. Hort. Berol. 227. 1809.

D. suaveolens β *macrocalyx* Sendtner in Martius Fl. Bras. 10: 161. 1846.

D. Gardneri Hooker Curt. Bot. Mag. sub pl. 4252. 1846.

A small tree, 2–5 meters in height; leaves glabrous or minutely pubescent, ovate to narrowly elliptic and entire; calyx broad (2–4 cm.), 3–5-toothed; the slender basal part of the white corolla usually exceeding the calyx, the broader distal part of the limb not abruptly flaring or recurved, the teeth 2–5 cm. long; anthers connivent; fruit fusiform (rarely seen); seeds irregularly angular, lacking the greatly thickened suberose testa of the previous species.

D. suaveolens is confined largely to tropical and subtropical climates; in the northern Andes, it is not grown above 1200 meters elevation. This species has been much more widely introduced than either *D. sanguinea* or *D. candida*.

Danert's suggestion (5) that *D. suaveolens* and *D. candida* may be conspecific deserves further consideration and, especially, experimentation. However, the association in *D. suaveolens* of several characters rarely seen in *D. candida* and the relatively very few intermediate specimens known, imply, at least for the present, that both concepts are of species status.

SPECIMENS EXAMINED:

UNITED STATES: *Small, DeWinkeler & Mosier 11158*. NICARAGUA: *Grant 1121*. COSTA RICA: *Allen 709*. PANAMA: *Hayes 101*. CUBA: *Clemente 2502; Hamilton 68; van Hermann 406, 622, 841; Howard 6552; Jack 4792, 7452, 8679; Salvoza 648; Shafer 7751; Wright 1641*. JAMAICA: *Britton 175, 3544; Harris 9599; Proctor 20815*. HISPANIOLA: *Ekman 7212; Holdridge 1045; Leonard 3885, 7567, 9232a; Leonard & Leonard 14512; Nash 754; Valeur 361*. PUERTO RICO: *Britton & Britton 7318, 10126; Britton, Cowell & Brown 4536; Britton, Steves & Hess 2408; Garber 66; Heller 4486; Johnston 929; Otero 426; Urban 337, 4258*. GUADELOUPE: *Duss 2598*. DOMINICA: *Eggers 622*. MARTINIQUE: *Duss 1924*. ST. VINCENTS: *H.H. & G.W. Smith 983*. COLOMBIA: *Schultes 6535*. ECUADOR: *Fuller 110; von Hagen 103; Schultes 3472*. PERU: *Killip & Smith 26355; Klug 3477*. BOLIVIA: *Williams 593*. PARAGUAY: *Hassler 4371, 12413; Jorgensen 7371*. VENEZUELA: *Allart 330; Aristeguieta 1594; Fendler 1014; Pittier 10422*. BRAZIL: *Dusen 10209; Gardner 560; Martius 106; Mexia 4412, 5341; L. B. Smith, Reitz & Klein 7242; White 1098*. GOLD COAST: *Vigne 1090*. TANGANYIKA: *Goodwin 31*. INDIA: *Biskam 2292; Erlanson 5497; Kingdon-Ward 17900; Koelz 1745, 4547; U. Singh 149*. BURMA: *Dickason 9156*. CHINA: *Chun 40029; Metcalf 7647; Taam 1903*. NEW HEBRIDES: *Kajewski 175*. NEW CALEDONIA: *Franc 2349; Guillaumin 8515*. FIJI: *A.C. Smith 4499*.

DOUBTFUL SPECIES AND HYBRIDS

D. vulcanicola A.S. Barclay in Bot. Mus. Leaflet. Harvard Univ. 18: 260 (1959), closely related to *D. sanguinea* R. & P., is distinguished by its cernuous flowers with light red throat, yellow mouth and red nerves, and by its warty, almost woody, fruit with smooth seeds. $n=12$. Schultes (pers. comm.) observed abundant seedlings of this at the type locality; possibly the population

can be regarded as an incipient species still confined to a single locality in southern Colombia.

COLOMBIA: *Barclay & Schultes* 147 (TYPE), 149, 177; *Pennell* 7093; *Pérez-Arbeláez & Cuatrecasas* 5960; *von Sneidern* 1898.

D. dolichocarpa (Lagerh.) Safford in Journ. Wash. Acad. Sci. 11: 186 (1921), based upon two collections by Sodiro from Ecuador, is distinguished chiefly by its very long (31 cm.), terete fruit. It resembles *D. suaveolens* in the very long corolla, stamens and pistil, but the short calyx, long corolla teeth and free anthers relate it to *D. candida*. *Bristol* 1387 (GH), from one of Sodiro's two collecting localities (Santo Domingo de los Colorados), has a fruit intermediate in size (16.5 cm.) and shape between this species and *D. candida*, but an extremely long corolla (44.3 cm.) and calyx (23 cm.) much exceeding those of *D. dolichocarpa* which are, respectively, 35 cm. and 13 cm. The calyces of this collection have conspicuous horn-like apices, as in *D. cornigera* Hooker.

D. longifolia (Lagerh.) Safford *ibid.* 186 (1921) is closely allied to *D. dolichocarpa*, but the single Ecuadorean collection by Sodiro is described as having very long, linear-oblong and sinuate-repand leaves, thus approaching those of *Methysticodendron Amesianum* R.E. Schultes, a striking clone discussed below. The style is also unusually long.

D. versicolor (Lagerh.) Safford *ibid.* 183 (1921) also closely resembles *D. dolichocarpa* but has a pointed calyx, ultimately reddish corolla, shorter stamens and pistil, a very long aristate fruit, and thicker, verrucose seeds.

Four of the tree *Datura* concepts are best interpreted as hybrids, three of them between *D. candida* and *D. sanguinea*.

D. arborea Linnaeus Sp. Pl. 1: 179 (1753), the first to be described, is rarely seen. While its affinity is with

D. candida, the shorter corolla and corolla teeth, and especially the ovoid fruit, are indicative of hybridization involving *D. sanguinea*. Danert (5) has not questioned the validity of *D. arborea* and has suggested that *D. candida*, *D. affinis*, and even *D. suaveolens* may be synonymous with the Linnaean species.

D. cornigera Hooker in Curt. Bot. Mag. pl. 4252 (1846); Lagerheim in Bot. Jahrb. Engl. 20: 663 (1895) is also similar to *D. candida*, but it differs in the very short corolla, in the more emarginate corolla lobes, in the capitate stigma, and especially in the calyx which tapers to a long subulate point. Though such a calyx is very rarely seen in the tree Daturas, several collections show intermediates between it and that of *D. candida* (*Bristol* 738, 1213, 1387; GH). The ovoid fruit, recorded by Lagerheim (*loc. cit.*), the size and form of the corolla, and the capitate stigma are all characters associated with *D. sanguinea*.

D. rubella Safford *ibid.* 185 (1921), with acuminate tipped leaves and a spathe-like, caudate-acuminate calyx again suggests hybridization between *D. candida* and *D. sanguinea*, though the red corolla (13–14 cm.) and the pistil and stamens are much shorter even than in *D. sanguinea*.

SPECIMEN EXAMINED:

ECUADOR: *Rose, Pachano & Rose* 22828 (TYPE; US).

D. mollis Safford *ibid.* 183 (1921) resembles *D. candida* but for the much longer calyx, stamens and pistil and its light pink corolla.

SPECIMEN EXAMINED:

ECUADOR: *Rose & Rose* 23418 (TYPE; US).

A uniquely attractive hybrid in highland central Peru (*Ochoa* 601; NY) has a very small (13 cm.) white flower

combining the characters of *D. candida* and *D. sanguinea*. Another (*Augusto 413*; NY), from Hispaniola, appears intermediate between *D. candida* and *D. suaveolens*, but it has yellow flowers. Both hybrids have the unusual horn-like calyx appendage of *D. cornigera*.

Methysticodendron Amesianum R.E. Schultes in Bot. Mus. Leaflet. Harvard Univ. 17: 2 (1955) undoubtedly belongs with the white-flowered species of tree *Daturas*. It differs from *D. candida* and *D. suaveolens* in its narrow linear-ligulate leaves with undulate margins, in the distally inflated calyx, the deeply divided, or adesmic, corolla having long spatulate lobes; it is, furthermore, monstrosly different in the distally contorted filaments, in the variable number of incompletely coherent styles exceeded by the stamens, and in the often three-locular ovary with one or more variably developed appendages homologous with the styles. $n=12$.

Barclay (3) determined the chromosome number as $2n=24$, and the haploid complement is now verified as $n=12$ (*Bristol 477, 764, 888, 1112, 1400*) as in all tree *Daturas* which have been examined.

Intensive study of *M. Amesianum* at the type locality in southernmost Colombia suggests the existence of not more than thirty-five trees, all in cultivation (4). Most of these were found to bear flowers with both two- and three-celled ovaries, as in a local cultivar of *D. candida*¹ confirming the earlier observations of Theilkuhl (14). Despite constant observation during thirteen months, no fruit was seen. Schultes recalled his lost collections of fruit as "unarmed, smooth, indehiscent and fusiform, about six inches in length and in shape very like the fruit of *Datura suaveolens*" (12). The fruit size, shape and variable number of locules imply a relationship with a cultivar

¹ An account of the unique *Datura* cultivars grown by the Sibundoy Indians is in preparation.

of *D. candida* which is also unique to the same locality.

Other observers of *M. Amesianum* have associated it with the tree *Daturas*. Theilkuhl (14) related it to the other diseased and curiously malformed *Datura* clones in the Valley of Sibundoy, while Barclay (3) suggested it could be, "the result of the action of a single pleiotropic gene mutation a monstrosity of some *Datura* species of subg. *Brugmansia*" Van Steenis (13) in discussing genotypic variability at the infraspecific level, cited *M. Amesianum* as, "a remarkable case of adesmy, a tendency which is recorded from various Solanaceae."

SPECIMENS EXAMINED:

COLOMBIA: Bristol 477, 764, 888, 1112, 1391, 1400; Fernández 2641; Fosberg 20406; Idrobo 2221; Mora 1023; Olday 639; Schultes 3256; Schultes & Cabrera 20079 (TYPE; GH); Villarreal 68.

Abnormalities suggestive of *M. Amesianum* have appeared in several species of *Datura*. Barclay (3) noted the deeply divided, spatulate-lobed corollas occurring in *D. innoxia* Miller (*Davidson* 1659; GH) and in *D. ferox* L. (*Venturi* 328; A). The most extreme modification is the highly adesmic "equisetum" form of *D. Stramonium* L. (*Moldenke & Moldenke* 11814; NY). This single recessive gene (1) causes nearly filiform leaves and both the calyx and corolla are divided almost to the base, the corolla appearing merely as filiform segments. In addition to the five stamens, there are at least six staminodia. Another *D. Stramonium* mutant, "quercina", also has a divided corolla and modified leaves and fruits (1). A collection (*Romero-C.* 5364; COL) from the Pacific coast of southernmost Colombia is similar to *M. Amesianum* but differs in the long-lanceolate leaves (as in *D. longifolia*), in the extension of the calyx tip into five distinct, long (7.5 cm.) subulate apices, and in the short (14 cm.)

corolla which barely exceeds the calyx. Neither the gynoecium nor any fruit of this curiosity has been examined.

Extra perianth whorls occur in both the tree and the herbaceous *Daturas*. Specimens of *D. candida* with double corollas are known from Bermuda (*Collins 441*; NY), Mexico (*Schultes & Reko 455*; ECON, GH), Costa Rica (*Heiser 3583*; IND), Chile (*Cameron s.n.*; US), Argentina (*Venturi 8495*; A) and the Philippines (*Sulit s.n.*; GH). A double-corollate form from California (*Wight 1661*; US) represents apparently a hybrid between *D. candida* and *D. sanguinea*. In the double forms, the inner corolla may be either longer, shorter or equal in length to the outer. A form with a cluster of numerous spatulate staminodia is represented by Model 290 in the Ware Collection of Glass Flowers at the Harvard Botanical Museum.

In addition to these conspicuous anomalies and to those described in the "species" discussed above, there are many collections representing additional variability in the tree *Daturas*. Among the variations are very long, ochraceous flowers (*Bristol 1297*; GH), S-curved styles (*Bristol 1314*; GH) and variously erose leaves (*García-B. 4640*, US; *Idrobo 2224*, COL; *Bristol 1268*, ECON) in *D. candida*, and pink flowers (*Bristol 1445*; GH) in *D. sanguinea*. Several trees at Santo Domingo de los Colorados, Ecuador, have brick red, as well as white, flowers which reach or exceed one-half meter in length (*Bristol 1734, 1736*; ECON).

As our knowledge of the tree *Daturas* increases, it is certain that more novel, perhaps striking and highly attractive cultivars will be found. We can hope that many more of the tree *Datura* cultivars will become established outside of the northern Andes, for the abundance of their huge, colorful and fragrant flowers deserves a much wider appreciation. The origin of the group and

the circumstances favorable to the development of its great diversity in exclusive association with man pose intriguing, and as yet unanswerable, questions to students of plant domestication and evolution, genetics, ethnobotany and archaeology.

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